Chapter 16

Life and Well-Being under Historical Ecological Variation: The Epidemiology of Disease and of Representations

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INTRODUCTION

In this chapter we report on aspects of research undertaken among a small population (the Mian) living on the northern fringes of New Guinea's mountainous backbone. The ethnographic setting is empirically unusual in important respects, and while our research demonstrates that cultural factors are integral to the epidemiological and broader social history of the population, it raises questions about the methodological shape of cultural epidemiology.

CULTURAL EPIDEMIOLOGY OF THE MIAN

Most of the field research we discuss in this chapter was conducted in 1986, the year *Writing Culture*, by Clifford and Marcus, was published. This volume did much to publicize the doubts some cultural anthropologists had about the concept that had long been taken to be at the heart of their discipline. Responding to the realities of a decolonizing world and critiques from neighboring disciplines, these anthropologists expressed their concern at the way anthropological conceptions of culture tended to essentialize other ways of life and to ignore political and historical processes as well as individual agency (see Chapter 2).

In this context, a relevant theoretical intervention in the debates about culture is that of the cognitive anthropologist, Dan Sperber, and his colleagues. Although the vigorously formulated arguments of this European wing of the "evolutionary psychology" movement have not proved popular with cultural anthropologists, we mention them here precisely because—as any Internet search engine will demonstrate—the term "cultural epidemiology" is sometimes applied to

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Sperber's view that the distribution of (mental and public) representations within a population of interacting individuals (an "epidemiology of representations") is precisely what constitutes a local culture (Sperber, 1996; Heintz, 2010). According to this perspective, the distribution of representations (and institutions) in a population depends upon the general psychological or cognitive capacities of humans, the properties of representations themselves, and the ecological context (which is sociological no less than biological) in which they subsist.

Although we will *not* use the term cultural epidemiology to refer to Sperber's approach, our research is precisely concerned with the distribution of practices (and the concepts, beliefs, preferences, and values—"representations"—they implicate) among a historically and linguistically defined population that is distributed across a biologically significant altitudinal cline. Our research is predicated on the view that people's understandings, values, and preferences are no less part of the etiology of patterns of sickness and well-being than such environmental factors as climate or mosquito-biting densities. Yet while cultural representations/meanings make a difference to Mian historical trajectories, their heterogeneity and contingency on other aspects of social existence give their analysis an irreducibly idiographic form. Our emphasis, consequently, also contrasts with the pioneers of the epidemiology of representations, because it is more focused on the socioecology of representation (as process *and* product) than on its cognitive basis. Gardner's Ph.D. thesis (1981) at least made it clear that data on the ecological setting, horticultural productivity, and morbidity and mortality of Mian communities could not be omitted from a convincing account of the historical development of the marked cultural variation within the Mian population.

The research discussed in this chapter was part of the effort to develop a better model of those historical processes. We believe our case demonstrates that, even in the face of overwhelming biomedical threats, populations like the Mian interpret and respond to events in ways essential to their historical fate.[1] The relevance of this case to a volume on culture-in-health (or cultural epidemiology) depends upon seeing the *necessity* of the specification of responses to events—and, hence, the dispositions that generate them—to historical outcomes. As Sahlins has argued (since 1976), the overdetermination of local cultural conditions by "externalities" like natural disasters, colonial intrusion, or—more to our point—variation in the prevalence of malaria, merely goes to the fact of cultural response, not the character of the response, which is a necessary condition of downstream events. In short, our case depends upon sheer ethnographic specificity no less than do those of cultural epidemiologists, even if we characterize cultural meanings in terms some among them would wish to challenge.

1. Although our epidemiological research sought to make clearer some of the dynamics underlying the precolonial distribution of Mian speakers, practices, and representations, we do not wish to suggest that these can simply be read off from the situation that ensued after the advent of Australian colonial control. On the contrary, precisely because the interactions between all dimensions of social life continued, the *Pax Australiana*, through government directives and Christian missions (which dispensed medical treatments and advice along with new practices relevant to the organization of bodies, souls, and relations between persons and groups), changed the historical trajectory of the Mian way of life quite dramatically. Nevertheless, it did so through processes at work prior to colonization. While we can only speak to the general dynamics of the postcontact history of Mian communities in passing, given the aims of this chapter, we nevertheless acknowledge that the vicissitudes of state control, mineral exploration in the area, and the interpretive synthesis of Christian and earlier understandings of how life might be lived (Robbins, 2004) have significantly impacted the cultural epidemiology of the region.

Mian Social Life

The Mian are the most northerly of the 15 populations of the Mountain Ok language family: south of them live another, larger Mountain Ok group, the Telefolmin; to their north dwell lowlands and riverine peoples speaking languages of different phyla; their western neighbors are another Mountain Ok group, the Atbalmin, while to the east live several small Ok and Ok-like groups. Although long-term settlements are rare above 1,100 m, the land in the southern portion of the Mian area contains peaks of 3,000 m, while the plains in northern and western parts are only about 200 m above sea level. Yet even higher altitude Mian populations occupy and exploit a range of habitats; hunting provides most of the first class protein and gardens, predominantly of taro (which, Mian say, is "our bone"), most of their energy. Crude densities of this population of hunter–horticulturalists vary with altitude (from an average of less than 1 person per km^2 in the lower altitudes to an average of roughly 3 per km^2 in the highest altitudes), but subsistence practices make precise determination of the land used very difficult and not very useful. Clearly, though, Mian subsistence practices were highly land-extensive.

The overwhelming botanical feature of the Mian area is primary and very old secondary forest, which carpets the entire landscape, broken only by river courses, land-slips, sparsely distributed human settlements, and gardens. Nevertheless, there are important differences between the kinds of forest found in the various altitudinal zones, which affect the productive activities (and the histories) of its inhabitants. To summarize radically, gardening productivity under Mian technology generally declines with altitude, while hunting returns increase.[2]

Mian speak of those who occupy ancestral territories in the higher altitudes to the east and south as *am nakai* ("men of the house"), while those descended

2. There are two discernible seasons on the northern slopes of the central ranges that the Mian occupy: from April to November it rains heavily on most days and in the remainder of the year it rains even harder. In terms of the classifications meteorologists use, the area displays the lowest possible degree of seasonality, and although there is a statistically significant difference in the amount of rain that falls in the two seasons, there is no period—excepting the occasional drought—when the soil is unsaturated.

from migrants to the lower altitudes in the north and west are designated *sa nakai* ("men of the bush"). This distinction is also used evaluatively to suggest that the *am nakai* remain true to tradition in a way that the *sa nakai* do not. Accordingly its usage is more complex than a simple dichotomy might suggest: those in the middle altitudes regard themselves as *am nakai* in relation to those in the lower altitudes but will sometimes acknowledge that they are *sa nakai* relative to those higher up.[3]

A crucial feature of Mian social life is its smallness of scale. Prior to European contact (approximately 1950) the Mian applied no superordinate ethnonym to themselves (Gardner, 2004); the population of roughly 2,500 was divided between 22 cognatic descent categories, occupying roughly the same number of territories (some named groups occupied more than one territory, while others shared a territory). In addition, many territorial populations were divided between more than one settlement and almost all households had garden houses in which their members spent considerable time. The smallness of face-to-face networks increases in sociological significance when set in the context of the considerable distances between major settlements (usually several hours walk) and Mian preferences for local endogamy and sister-exchange marriage. Although the exigencies of sex ratios mean that local exogamy actually occurs in about 50% of marriages, variation across Mian territory is considerable. The sentimental ties between cross-sex siblings and the considerable distances between communities that make endogamy desirable also mean that exogamous marriage involves the couple in dual residence, which also runs at around 50%. Mian social organization presents, then, as a set of linked local clusters, within each of which social relations are, for most individuals, highly concentrated, yet which are highly permeable. Individual territorial mobility is significant and communities and networks are reconfigured steadily, even over the short to medium term.

Social life and political practice, accordingly, revolve around the maintenance of local communities. The number of folk rather than land limits the effectiveness of local groups and the well-being of communities. In Marx's terms, the limiting productive force is labor power rather than the means of production. Accordingly, and despite explicit values concerning patrifiliation, families are often drawn to what seem to be greener pastures elsewhere, for a shorter or longer period, or permanently.

In precolonial times, group mobility was also significant since settlements were subject to roughly cyclical rhythms. A group would pioneer an area, under the leadership of an impressive man and dwell in a single large, multihearth communal house, and a few garden cycles later, the community would be divided into smaller households units, sometimes dispersed across several hamlets. When hunting returns began to diminish, good garden land became harder

3. This distinction, its relation to the marked variation in the form and organization of (the pan-Mian male cult practices, and its sociological correlates framed Gardner's initial research (1975–1977

to find and other aspects of the good life were judged to be on the wane, a territorial community (or, often, some portion of it) would cross a watershed to a new territory. Settlement patterns were not homogeneous throughout the Mian area, however. The lower altitude *sa nakai* communities tended to move more frequently, and sustain greater levels of dispersion for longer periods of time than *am nakai* groups.

Residential patterns were always connected to the fortunes and skills of locally charismatic leaders, which were subject to variation due to chance and to competition between them. Such competition was mostly incipient in that a family attracted by conditions in another settlement could have a significant impact on the relative size of the one it left (given average settlement size), but when it was between men of the same territorial community, it was often overt and could become bitter.

The factors outlined above underpin the peculiarly contingency-prone nature of Mian social life: intracommunity and intercommunity relations are susceptible to sudden disruption as a result of factors that are contingent with respect to the formal structure of those relations. Passions resulting from an illness or death that is attributed to sorcery, or from a slight and the festering sense of betrayal it produces, or a dramatic breach of a threshold in a simmering conflict can suddenly drive a section of a community to move elsewhere. And if the bonds of trust and loyalty that bind members of a primary community are in any case under strain (as they sometimes are if two men display the qualities expected of a leader), then such an event may split a whole community. Other factors countered this susceptibility to fission, but these are unevenly distributed across the Mian area. There were two important and interconnected factors. First, there is the involvement of a community in subregional cult practices, which entailed the joint initiation of boys and young men, a significant degree of dependence upon cult seniors in other settlements, and a general sense that the fates of component communities were bound up with one another. Cult elders had tremendous power with respect to communities and their leaders, as well as a personal and transcendental interest in maintaining their congregations. Thus, the power of cult seniors was particularly significant in those situations of conflict that might otherwise lead to community division. Someone (in living or spiritual form) was always thought to be responsible for the death of an adult, and political conflict, including armed violence, was frequent after a death (Gardner, 1987). Cult elders were crucial to limiting the severity of the consequences of this source of conflict. The second factor countering tendencies for settlements to divide involved warfare. The communities with the strongest commitment to cult were the *am nakai*, whose territories were closest to powerful (e.g., Telefol) enemies who raided and/or were raided by the Mian. Alliances, and the cordial relations these entailed, were therefore of greater significance to the high altitude than to the lowlands Mian.

The broad history of the Mian runs thus: groups and subgroups have been expanding into lower altitudes and different ecological zones for the last four

or five generations. The impetus for this movement is intimately connected to the expansion of the Telefol from their salubrious central highland valleys (Craig and Hyndman, 1990). As different Mian groups migrated into new areas (some were pushed, some less directly induced to move), their relations with those groups that remained in the higher altitudes and with one another were transformed. The transformation of social networks, the effects of which are evident in the content and form of intergroup and intragroup relations, is a result of people's responses to their changed circumstances and the effects of these on local communities. Especially important here are the changes in (1) the social volume and social density of subpopulations (to use Durkheim's handy terms), (2) patterns of morbidity and mortality associated with malaria and other insect-borne parasites, (3) the productivity of subsistence that migration has brought about, and (4) the extent to which local communities take part in multicommunity cult practices. The situation of the Mian population in the 1970s indicated a cline in almost all of the parameters just listed: larger, more densely settled, and healthier populations in the higher altitudes, committed to the local variant of the pan Ok initiation cult and enjoying better agricultural yields, contrasted with smaller, less densely settled, less healthy populations whose agriculture was less productive and among whom the cult and its ritual activity had become attenuated, all in rough proportion to how much lower in altitude they were than the groups still living on ancestral territories.

We want to underline the fact that the distinction between the communities of the *am nakai* and those which have moved into new (lower altitude) areas in the last few generations, *sa nakai*, is not merely a matter of historical geography, nor is it purely an evaluative term. Through its reference to power and the authenticity of cult practices of the different segments of the population, it is relevant to behavioral differences of some sociological moment. As a male initiatory cult, which was held to be the source of the power sustaining both subsistence production and the moral strength and fertility of human beings that Mian life depended upon, cult practices and the status divisions and taboos that were central to them were aspects of quotidian life: relations between men and women, seniors and juniors, people and foods and places were all normatively rationalized in terms of the cult and subject to sanction by cult elders. The precolonial attenuation of cult practices among *sa nakai* made for quite profound differences in the quality of daily social life, which is why *am nakai* elders were so scandalized by what they saw as the apostasy of the lowlanders. And given that cult involvement also indexed the web of alliances relevant to the standing conflict between Mian, Telefol, and Atbal communities, we can appreciate why high-altitude elders spoke with dismay of the more fractious lowlands communities and the readiness with which they split or attacked one another (Gardner, 1981).

Those lowlands communities could not avoid being susceptible to ecological contingencies, including disease, accident, and interpersonal conflict.

Ever since colonial contact, for example, government officials have noted the disastrous effects of influenza on the Mian. While these are postcontact tragedies, they do illustrate the comparative vulnerability of small social formations to local catastrophes and are consistent with the presence of hyperreactive malarious splenomegaly (see below), a condition that would have pre-existed the advent of Europeans. Less dramatic, but still very important to the overall Mian picture, is the variation in relative demographic fortunes that small community size entails. As suggested earlier, changes of residence by small numbers of people can significantly alter the relative political position of a community. Group histories demonstrate that even apparently trivial events, such as the killing of a domestic pig by a dog or a hunting accident, can spark a major realignment of political affiliation as two or three families remove themselves elsewhere. But the most frequently encountered contingency, and the one most threatening to good order, is disease. Any death is the occasion for sorrow and anger, and the death of any adult is certain to produce very great anger and an accusation of sorcery. In the past, the death of an important man or woman was liable to produce a raid on another community or the death of someone in the deceased's community accused of sorcery.

We hope we have presented a *prima facie* case for the relevance of the epidemiology of malaria to the cultural anthropologist of the Mian.

Malaria among the Mian

Like most other parts of New Guinea's highlands fringes, Mian territory is characterized by a sparse human population with relatively poor health indicators. Health surveys here are few, and health facilities have always been basic and unreliably available. However, it is abundantly clear that general health is poor and premature mortality is alarmingly high. While causes of ill health are certainly multiple—none is of greater concern than malaria, the cause to which fevers are normally attributed in the absence of confirmatory tests by anyone treating illness here.

Our characterization of Mian malaria draws principally on the survey of the population we conducted in collaboration with the Papua New Guinea Institute of Medical Research (Attenborough et al., 1996, and other unpublished information), to our knowledge the only malariometric survey yet undertaken. This was a cross-sectional survey, consisting of a demographic interview, physical examination, and thumb-prick blood sampling for malarial parasitemia, covering all available and consenting Mian individuals from roughly 25 settlements, totaling 626 (of an estimated 962) across all ages and both genders, surveyed at four survey locations within the western and central parts of Mian territory. Refusal rate was negligible so that population coverage was essentially limited only by geography, with males somewhat more likely than females to travel from the remoter settlements to our survey locations.

The altitudinal range the Mian exploit is climatically and ecologically significant; although it lies entirely within the range where malaria occurs endemically

in New Guinea, the altitudinal gradient in ambient temperature exerts some impact on the rate at which the life cycle of the *Plasmodium* parasite proceeds while inside the *Anopheles* mosquito, and hence on the dynamics of malaria transmission and epidemiology (Attenborough et al., 1997). The 1986 survey focused on the groups in the lower lying western and central portions of the territory, where earlier fieldwork had suggested that settlements were smaller, population densities lower, and health poorer, than in ancestral Mian territories. Even so, the altitudinal range covered by the survey was appreciable (150–1,000 m), and survey locations were chosen to maximize the representation of people normally resident at both ends of this range.

The individuals surveyed were predominantly young (41% under 15 years, 4% 50 years or over), and this shortfall of older people appears representative of the population. Approximately 37% were found to have malaria-positive blood slides at the time of the survey; 68% of infections were of *Plasmodium falciparum*, the most virulent of the human malarias. Malaria parasitemia rates varied strongly with age (peaking at 80% in 2–4-year-olds and declining steadily to 15% in adults, for all *Plasmodium* species) but not with gender. Similar findings apply to parasite density, indicating not only that young children were the most frequently infected members of the population, but also that they were also the most heavily infected. Even though the Mian in 1986 did have limited access to antimalarial measures, these results much more closely resemble baseline results from the Wopkaimin (a southern Mountain Ok people) in the Ok Tedi baseline survey in 1982–1983 than those from the 1986 re-survey of the Wopkaimin following four years of intervention associated with the Ok Tedi mine project (Lourie, 1987).

Spleen enlargement (splenomegaly), although it can have causes other than malaria, is generally attributed to malaria when population prevalence is high (Bruce-Chwatt, 1985). The Mian survey showed that splenomegaly was near-universal and frequently the degree of enlargement was very high. Strikingly, over 60% of every age group had a Hackett spleen Grade 3 or greater, a figure that rose to over 80% among 5-to 14-year-olds. No significant gender differences were found. Comparison with other surveys suggests that whereas the Mian in 1976 and the Wopkaimin in 1982 had similar splenomegaly levels, they had alleviated for the Wopkaimin by 1986 (consistent with malaria control measures) but had deteriorated somewhat for the Mian, most likely owing, we speculate, to a historical increase in the prevalence of risk factors. The high frequency of splenomegaly among Mian adults as well as children suggests that not only hyperendemic malaria (Bruce-Chwatt, 1985) but also hyperreactive malarious splenomegaly (Crane, 1986, 1989)—an atypical and disadvantageous immune response to recurrent malaria, associated with high risk of premature mortality from ill-defined immediate causes, probably including spleen rupture and intercurrent infection—are major health problems and probably the leading health problems, for the Mian. Their implied burden of ill health is overwhelming, individually and perhaps demographically too.

TABLE 16.1 Mian *P. falciparum* Parasitemia Rates (%) by Age Group and Altitude of Usual Residence, Sexes Combined, 1986

Age Group	<2 Years	2–9 Years	10–19 Years	20+ Years
N	38	135	144	309
Resident 600 m+ a.s.l.	41.2	40.9	42.2	11.5
Resident < 600 m a.s.l.	47.6	59.3	29.3	16.9
p value (χ^2 test)	N.S.	0.04	N.S.	N.S.

So, within the internally contrasted microcosm that is the Mian physical and sociocultural world, what local variation is there in their health? How does it articulate with the other kinds of variation, discussed earlier, between the *am nakai* and the *sa nakai*?

While there are limits to what can be inferred from a single cross-sectional survey, there do appear to be some meaningful relationships here. We take altitude to be a rough measurable proxy for the complex of correlated sociocultural differences summarized above.

Overall, we find, in a series of unpublished analyses of which some aspects are summarized in Table 16.1, that statistical relationships between altitude of residence and either malarial parasitemia or parasite density are neither strong nor entirely consistent. Parasitemia rates are high in both altitudinal groups: nonetheless there are patterns. For example, in all age groups but the 10-to 19-year-olds, parasitemia rates are higher in the lower altitude groups, whether the crude parasite rate (all *Plasmodium* species) or *P. falciparum* only is considered. The difference is statistically significant for *P. falciparum* at the 5% level only among 2- to 9-year-old children.

We found a more consistent, yet still not very strong, relationship between altitude and splenomegaly. Raw spleen grade was weakly negatively but significantly correlated with altitude in the 2- to 9-year-old and 20+-year-old age groups, and uncorrelated in the other age groups. Table 16.2 shows a cross-tabular summary of essentially the same relationship, assessed via the percentage of individuals with spleens of Grade 3 or greater. Again, the lower altitude group again emerges as the worst affected consistently from age 2 years onward and significantly in adulthood, although the association is almost swamped by the extreme prevalence of splenomegaly at all ages.

To this we may add altitude-related findings from a small-scale entomological survey run in tandem with the Mian malaria survey in some of the same locations. Proportions of anopheline mosquitoes carrying malaria circumsporozoite antigens diminished monotonically with altitude, from 170 to 650 m, with no anophelines captured at 1,000 m. This is a potentially important relationship

TABLE 16.2 Mian Splenomegaly (% Spleen Grades 3–5) by Age Group and Altitude of Usual Residence, Sexes Combined, 1986

Age Group	<2 Years	2–9 Years	10–19 Years	20+ Years
N	35	135	144	309
Resident 600 m+ a.s.l.	60.0	77.3	77.8	66.7
Resident < 600 m a.s.l.	60.0	85.7	82.8	77.5
p value (χ^2 test)	N.S.	N.S.	N.S.	0.04

complicated by variable mosquito abundance that is probably related more to local ecology than systematically to altitude (Attenborough et al., 1997). Even at 650 m, however, the observed malaria inoculation rate would be more than sufficient to sustain high human malaria transmission in the absence of accessible treatment services.

Running through these results are undramatic but recurrent signs that Mian people do indeed, as we had hypothesized, run an exacerbated health risk from malaria when they live in the lower lying portion of their lands. Are there reasons beyond the fact that even the upper end of the West Mian altitudinal range is not high enough to escape endemic malaria transmission, why this effect is not more powerful? There are probably a number answers to these questions.

Parasitemias may be transient and, especially among perennially exposed adults, there may be a strong stochastic element in who may happen to exhibit parasitemia at the time of a survey, even in the absence of treatment. When bed nets or malaria treatment is available, one of the sources is at a government station located at 180 m altitude above sea level (a.s.l.). Local ecological variation, for example, proximity to swamps favorable to mosquito breeding, no doubt plays a part. Our entomological survey showed that very significant variation in biting densities between villages only 1 km apart (as the mosquito flies) is possible. Varying availability of alternative hosts for the anophelines to bite, such as pigs, may play a part too. The landscape is steeply dissected, so that within short horizontal distances, certainly within those readily traveled by people and probably by anophelines too, there can be significant altitudinal variation. Even those based in higher altitude settlements can raise their exposure to night-biting mosquitoes through extended visits to gardens at lower altitude or to lower-lying settlements.

A more extensive survey than the 1986 one might be able to tease apart more fully these contributors to variability. One way further into this complex of ecological variables may be suggested from within our own dataset. If we classify villages according to their location either at or above the level of their local river, and examine again *falciparum* parasitemia and splenomegaly Grade 3+, we find the pictures shown in Tables 16.3 and 16.4. This new variable is

TABLE 16.3 Mian *P. falciparum* Parasitemia Rates (%) Sexes Combined, by Age Group and Village Situation of Usual Residence, 1986

Age Group	<2 Years	2–9 Years	10–19 Years	20+ Years
N	38	135	144	309
Resident above river level	37.5	44.4	40.5	10.7
Resident near river level	50.0	57.8	30.4	17.5
p value (χ^2 test)	N.S.	N.S.	N.S.	N.S.

TABLE 16.4 Mian Splenomegaly (% Spleen Grades 3–5) by Age Group and Altitude of Usual Residence, Sexes Combined, 1986

Age Group	<2 Years	2–9 Years	10–19 Years	20+ Years
N	35	135	144	309
Resident above river level	50.0	75.6	76.2	62.1
Resident near river level	66.7	86.7	83.3	80.1
p value (χ^2 test)	N.S.	N.S.	N.S.	0.001

not independent of altitude: there are fewer villages above river level in the lower altitudes. Again we see an almost consistent but not overwhelming trend in the direction expected, reaching statistical significance only in the case of splenomegaly among adults.

CONCLUSION

Although the altitudinal cline across which Mian are spread does not suggest that the risk of mortality and morbidity associated with malaria increases regularly or dramatically, in line with the sociocultural differences encoded in the Mian distinction between *am nakai* and *sa nakai*, the data indicate significant variations between the higher and lower altitudes overall, and make clear the generally large burden the disease imposes. They also underline the contingency-prone nature of social networks that this setting produces, as well as the extent to which interpretive dispositions that constitute part of the cultural fabric are integral to the production of that effect.

If malariometry is insufficient to explain the impact of the disease on local social networks in the lower altitudes, then a study that accounts for the interpretive practices of lowlanders, and the cultural representation of trust, envy, and enmity that thematize them may produce a more convincing account of the interaction between the epidemiology of the disease and the epidemiology of representations.

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